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Question Paper Code : 11297

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Elective

Engineering Design

ED 9258/ ED 958/ UED 9158/ 10222 EDE 24 — INDUSTRIAL ROBOTICS AND
EXPERT SYSTEMS

(Common to M.E. – CAD/CAM /M.E. – Computer Aided Design and M.E Product
Design and Development)

(Regulation 2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How many DOFs are required to position an end- effectors at any point in 3D space?
2. Find the coordinates of point $P(3,5,7)^T$ relative to the reference frame after a rotation of 30° about Z-axis.
3. What is the effect of acceleration on torque of drives in robot?
4. What is stripping device?
5. What are the essential requirements for success in robot vision?
6. When does a workplace include several obstacles, how do you propose a novel trajectory path planning method for a robot manipulator?
7. List out few robot application areas in manufacturing.
8. What are the advantages of off- line robot programming.
9. State the methods for defining position in space irrespective of robot configuration.
10. What are the goals of AI in research?

PART B — (5 × 16 = 80 marks)

11. (a) (i) "Robot has established itself as a powerful productivity tool in industries". Discuss. (8)
- (ii) "Final accuracy of a robotic system depends on its mechanical inaccuracies, the computer control algorithms and the system revolution". Discuss. (8)

Or

- (b) (i) Briefly explain the kinematic control of robots. (8)
- (ii) Write a descriptive note on "Basic Robot Motions". How are these motions provided to a robot? (8)
12. (a) Sketch the pneumatic circuits to control different motions of cylindrical and Cartesian coordinate robot. (16)

Or

- (b) Describe the robot gripper to take measurements of outer and inner dimensions of objects with the aid of pneumatic gauging. (16)
13. (a) (i) Describe with neat sketches the principle of working of wrist sensors. (10)
- (ii) How are the joint forces sensed by sensors? Explain. (6)

Or

- (b) (i) Describe in detail about the image process analysis. (8)
- (ii) Explain briefly the machine vision applications by industry. (8)
14. (a) How are the robot work cells organized? Explain in detail. (16)

Or

- (b) What are the possible robot applications in manufacturing industries? Classify such robots from the view points of drives and control. (16)
15. (a) Describe briefly the various kinds of robot programming techniques. (16)

Or

- (b) Consider two conveyor systems running parallel with centre to centre distance of 500 mm at same level. An industrial robot is fixed centrally between the conveyors for pick-and-place operation between the conveyors. The conveyor speed is assumed to be constant. Draw a schematic view of the above described system and write a VAL robot off-line program for pick-and-place operation along with complete description. (16)